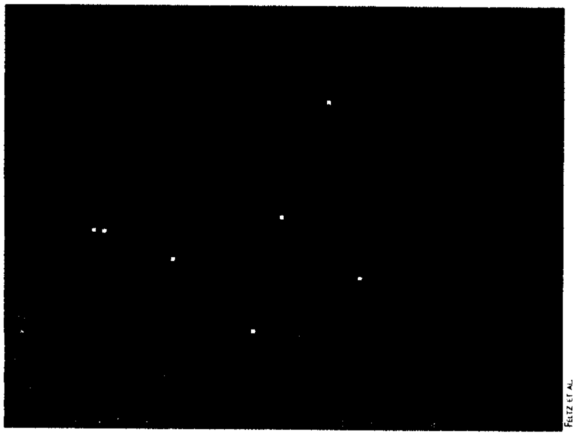

Fig. 1. A *GOES-8* visible satellite image of the IHOP field experiment domain. The white dots indicate locations of fixed ground-based instrumentation supported by the DOE ARM program or IHOP. The location of the IHOP Homestead site is indicated.

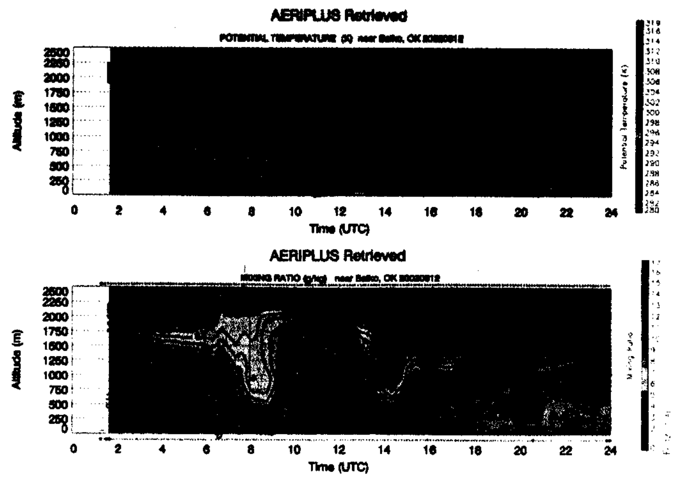

Fig. 2. A time–height cross-section of AERI derived potential temperature and water vapor mixing ratio from 12 June. A rapid water vapor fluctuation is apparent between 0600 and 1400 UTC.

1000 UTC, and dried again between 1200 and 1300 UTC. Total precipitable water (TPW), measured by a global positioning satellite-based (GPS) system, fluctuated by greater than 30% (1 cm) three times in 10 h (Fig. 3).

These water vapor transitions were not detectable by surface moisture observations and could only be resolved with high temporal remote sensing capability. If radiosondes had been launched from this location at standard synoptic times (0000 and 1200 UTC), the moisture perturbations would have also been missed altogether.

This mesoscale event provided a unique water vapor signal from which various remote-sensing instrument comparisons could be conducted. Hourly Geostationary Operational Environmental Satellite (GOES) sounder–derived 10-km × 10-km TPW measurements were compared to the interferometer and GPS measurements. The *GOES-11* TPW tendency (see Fig. 3) was consistent with the interferometer and GPS TPW until 1100 UTC, when the *GOES-11* TPW amounts failed to capture the increase and decrease (likely due to the spatial resolution of the GOES sounder footprint).

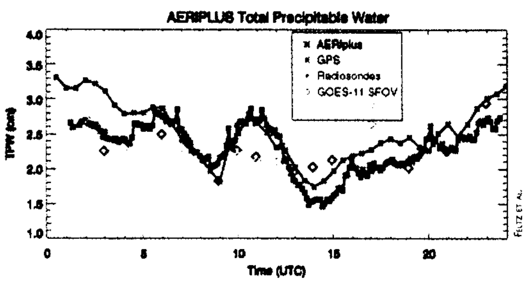

Fig. 3. A time series comparison of all possible Homestead site TPW measurements on 12 June: AERIplus (black), GPS (red), radiosondes (dark blue), *GOES-11* (green), and *GOES-8* (light blue) SFOV.

In situ and remotely sensed IHOP datasets, specifically for this case study, will be used to improve the initial analysis for the Penn State MM5 version 3.5 atmospheric prediction model. Future work includes the analysis of MM5 model output and wind profiler data to understand the origin and interaction of the dramatic water vapor transitions remotely sensed over the Homestead site.—Wayne F. Feltz (Space Science and Engineering Center, University of Wisconsin— Madison), Derek J. Posselt, John R. Mecikalski, Gary S. Wade, and Timothy J. Schmit. *"12 June 2002 Rapid Water Vapor Transitions during the IHOP Field Program,"* Observing and Understanding the Variability of Water in Weather and Climate.

Precipitation-Induced Isotopic Variations in Streamflow

The overall stream response to intense precipitation is a result of complex pathways and mechanisms through which precipitation runoff, reservoir outflow, displaced soil moisture, shallow subsurface flow, and other factors act upon the stream. As a result, the relative contribution of all the hydrologic components is significant to the formulation of accurate stream response simulation models. Using stable isotope tracers provides new insights into the controlling factors of stream response, which otherwise are masked in traditional stream hydrograph studies.

In particular, variation in the naturally occurring stable isotope ratios of oxygen and hydrogen can be effectively used to trace the pathways of water movement in the catchment area. Evaporation leads to distinctive shifts in the isotopic composition of water, making it possible to differentiate input to the stream from precipitation versus from sources such as the stock pond and stored soil water.

As part of the Department of Energy's Water Cycle Pilot Study, measurements of the stable isotope ratios of oxygen and hydrogen in precipitation, stream water (Fig. 1), and soil water have been used to study the response of a drainage system to two closely spaced storm events in the Walnut River watershed in the southern Great Plains.

Fig. 1. Downstream location of the creek showing precipitation-induced flows.

The stream catchment area is mostly composed of grasslands with some agricultural lands and a stock pond located near the headwaters region that outflows into the creek (Fig. 2).

Fig. 2. Upstream location of the creek showing the outflow from a pond in the headwaters region.

The isotope data showed that during the initial hours following the storms, flow upstream was dominated by the outflow from the pond, while precipitation runoff was the major factor influencing the downstream flow. The gradual replacement of evaporated pond water by precipitation is reflected in the isotopic ratios of the upstream samples. The downstream samples exhibited an increasing input from displaced soil moisture, as the influence of precipitation runoff diminished.

Future work will focus on incorporating isotopic data into a numerical hydrologic model designed to help forecast flood assessment and to analyze effects of land usage on stream response.—Madhav V. Machavaram, Kathy E. Bashford, Mark E. Conrad, and Norman L. Miller. *"Precipitation-Induced Isotopic Variations in Streamflow,"* 17th Conference on Hydrology.